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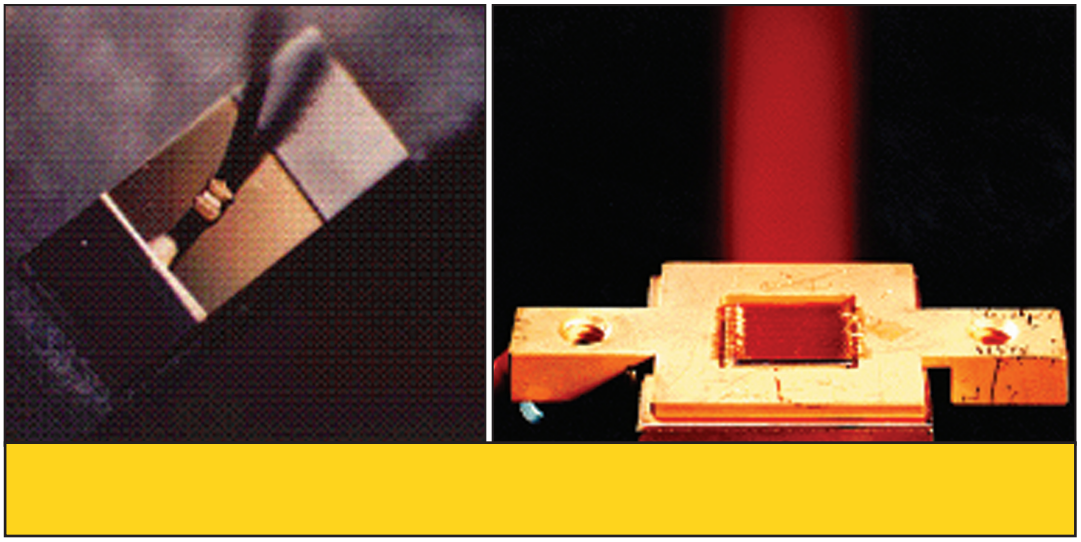
Success Story

LOW-COST DIODE LASER-BASED SENSORS DEVELOPED FOR ENVIRONMENTAL MONITORING



Through a Small Business Innovation Research (SBIR) Phase I effort, Southwest Sciences showed that near-infrared diode lasers are useful for the detection of trace gases by optical absorption. As a result of this effort, Southwest Sciences sold diode laser-based instrumentation for the measurement of combustion gases, including several toxic gases, in tank fires.

Researchers use this instrumentation to characterize the performance of several fire suppressants and to measure concentrations and time evolution of toxic gases in tank crew compartments. Commercially, Southwest Sciences and an instrument manufacturer are jointly developing instrumentation for monitoring and process control in the semiconductor industry. The market forecast for this application alone is several hundred instruments per year.

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Accomplishment

The Directed Energy Directorate requires the ability to detect trace amounts of moisture to improve the manufacturing process for microelectronics and semiconductor laser devices. Southwest Sciences exploited the properties of diode lasers originally designed for applications, such as fiber optic communications and compact disk players, and developed instrumentation to detect ultratrace (sub parts per billion) levels of moisture in process gases.

The technology developed by Southwest Sciences has many potential applications for both the military and commercial sectors. The military can use this technology to monitor toxic gases on the battlefield and hazardous gases in rocket launch areas, and provide on-line diagnostics and control of advanced jet engines. Some promising commercial applications include monitoring and control of chemical processes, monitoring pollutant gas emissions, and measuring trace impurities in gas processes.

Background

In order to improve the yield of manufacturing processes and the efficiency of semiconductor laser devices, manufacturers must closely monitor these processes to control the amount of moisture present. Many gases have characteristic absorption bands that overlap the operating wavelengths of these lasers and, in many cases, it is possible to provide highly selective and sensitive measurements of trace concentration of these gases.

In Phase II of this SBIR, Southwest Science focused on the development of a low-cost diode laser gas sensor that would be marketable for widespread commercial use. They developed a trace moisture sensor using a vertical cavity surface-emitting laser with excellent optical and spectroscopic sensitivities.

Directed Energy
Emerging Technologies

Additional information

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